

STATE OF ALASKA

Cold Injuries

and

Cold Water

Near Drowning Guidelines

EMT-I Version

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STATE OF ALASKA

COLD INJURIES

AND

COLD WATER

NEAR DROWNING GUIDELINES

INTRODUCTION

These guidelines have been developed for use by prehospital, clinic and hospital personnel dealing with cold problems in Alaska. They are meant to be guidelines, not absolute rules, governing the treatment of hypothermia and cold water near drowning.

Field personnel, from first responders through paramedics, may not want to carry the full set of guidelines with them. It may be more practical simply to carry the portion pertinent to their level of training, and to be generally familiar with the content for their level.

The full set of guidelines probably would be best utilized in hospital radio rooms, where calls come in from prehospital personnel with various levels of training.

To illustrate: If a call comes in to Dillingham hospital from Naknek about a hypothermic patient, the hospital personnel need to ask the level of training of the prehospital personnel. If the caller is an EMT-II, for example, the hospital personnel can then turn to Hypothermia-EMT-II and direct the EMT in appropriate treatment.

Readers should note that these protocols are primarily designed to be used in EMS education and as a reference for the treatment of cold injuries and for use in assisting in the development of local standing orders. In the absence of standing orders, they may be used to guide the treatment of cold injuries until communication with a physician is established.

These guidelines are **not** intended to serve as a comprehensive teaching document on cold related illnesses and injuries. Consequently, those teaching the treatment of cold injuries must be prepared to elaborate on pathophysiology and treatment.

HYPOTHERMIA

General Points

- A. The evaluation and treatment of hypothermia whether wet or dry, on land or water, are similar. Specific differences are covered in the following pages.
- B. In the cold patient, a rectal temperature is one of the vital signs. In terms of the ABC's, think:
 - A-Airway
 - B-Breathing
 - C-Circulation
 - D-Degrees
- C. In the cold patient, body core temperature becomes an important sign. While obtaining a body core temperature is important and useful for assessing and treating hypothermia, there is tremendous variability in individual physiologic responses at specific temperatures and a low reading thermometer may not always be available. Therefore, these guidelines are not solely based on the patient's measured temperature.
- D. Assessment of temperature:
 - 1. The simplest assessment of a patient's body temperature may be performed by placing an ungloved hand against the skin of the patient's back or chest. If the skin feels warm, hypothermia is unlikely. This method, however, does not provide a reliable estimate of the patient's core temperature.
 - 2. Axillary and oral measurements are poor measures of core temperature. Rectal temperatures more closely approximate the core temperature and are a practical method for use in the field. It is acknowledged that other methods of estimating the core temperature exist. Use of techniques other than rectal measurements should be evaluated for their accuracy and practicality in the field. The decision to use a methodology other than rectal temperatures should be made in consultation with the service's physician medical director.
 - 3. Patients with cold skin should have a rectal temperature taken with a low reading thermometer. Household thermometers are useless in this setting. Low reading rectal thermometers should be capable of measuring temperatures as low as 70°F.
 - 4. **CAUTION:** Electronic thermometers may not be accurate if they are left in the cold.
- E. The hypothermic patient should be assessed carefully for coexisting injuries and illnesses. The signs and symptoms of hypothermia may be mimicked by alcohol, diabetes, altitude sickness, overdose and other conditions. As a result, a thorough assessment of the patient is imperative. Associated significant illness or injury may exacerbate hypothermia. Splinting should be performed, when indicated, with caution to prevent additional injuries to frostbitten tissues.
- F. Ensure that items, oxygen, and fluids (both oral and IV) coming into contact with the patient, are warmed.
- G. Since cold skin is easily injured, avoid direct application of hot objects or excessive pressure (e.g. uninsulated hot water bottles, tourniquets).
- H. As in any resuscitation, a positive attitude is important. The hypothermic patient may appear to

be beyond help because of skin color, pupil dilation, and depressed vital signs. However, patients suffering from severe hypothermia have been resuscitated. Therefore, be cautious about assuming the patient cannot be resuscitated. It is also wise to be cautious about what you say during the resuscitation. Seemingly unconscious patients frequently remember what is said and done.

- I. Severe cold injuries are encountered relatively infrequently. Consequently, it is necessary that you preplan the management of these conditions and that you are familiar with the appropriate equipment.
- J. The inside of the ambulance and any rooms where hypothermia patients are treated should be warm enough to prevent further heat loss, ideally above 80° F (26.7° C).
- K. CPR has no significant effect on survival of the hypothermic patient in the following situations, and, in accordance with state law and local standing orders, CPR should not be initiated when:
 - 1. Cold water submersion patients who have been under the water for more than 1 hour.
 - 2. Hypothermia patients with a core temperature of less than 60° F (15.5° C).
 - 3. Obvious fatal injuries, e.g. decapitation.
 - 4. Frozen patients, e.g. ice formation in the airway.
 - 5. The chest wall is so stiff that compression is impossible.
 - 6. Rescuers are exhausted or at danger.
- L. Recent legislation (AS 18.08.089) has empowered EMTs, paramedics and physicians-assistants to declare death in the field following 30 minutes of properly performed advanced life support, even when the patient is hypothermic. It is recommended in these cases, however, that resuscitations be continued for at least 60 minutes and be combined with the rewarming techniques found in these guidelines before being terminated. Please note that this legislation does not authorize Emergency Trauma Technicians and the general public to pronounce a patient dead.
- M. The patient with severe hypothermia must be handled very gently. The cold heart is very prone to cardiac arrest. Even cautious movement of the patient may induce cardiac arrest.
- N. The indications for the pneumatic anti-shock garments are the same as for normothermic patients. The use of the PASG is controversial and they should be used in accordance with established local protocols.
- O. The pulse should be checked for up to 45 seconds when assessing a hypothermic patient or a patient who has been removed from cold water.

HYPOTHERMIA

General Public

A. Assessment of Patient

1. Severe Hypothermia: If the patient is cold and has any of the following signs or symptoms, he is considered to have severe hypothermia:
 - a. Temperature of 90° F (32.2° C) or less.
 - b. Depressed vital signs, such as a slow pulse and/or slow respiration.
 - c. Altered level of consciousness, including slurred speech, staggering gait, decreased mental skills, or the lack of response to verbal or painful stimuli.
 - d. No shivering in spite of being very cold. (Note: This sign is potentially unreliable and may be altered by alcohol intoxication.)
2. Mild Hypothermia: If the patient is cold and does not have any of these signs or symptoms, he is considered to have mild hypothermia.

B. Basic Treatment for Hypothermia

1. Prevent further heat loss. Insulate from the ground, protect from the wind, eliminate evaporative heat loss by removing wet clothing or by covering the patient with a vapor barrier (such as a plastic garbage bag), cover the head and neck and move the patient to a warm environment. Consider covering patient's mouth and nose with a light fabric to reduce heat loss through respirations.
2. Activate the emergency medical services system to provide transport to a medical facility.
3. Do not give alcohol.

C. Treatment for Mild Hypothermia

1. Treat the patient as outlined in Section B.
2. If there is no way to get to a medical facility, rewarm the patient gradually by:
 - a. Placing patient in as warm an environment as possible.
 - b. Increasing heat production through exercise and calorie/fluid replacement. This method of adding heat is particularly important when emergency care is not readily available as in remote or prolonged transport environment.
 - c. Rewarming passively through the application of insulated heat packs to high heat transfer/loss areas such as the head, neck, underarms, sides of the chest wall, and groin, and heavy insulation to prevent further heat loss.
 - d. Considering warm showers and warm bath if the patient is alert.
 - e. Placing patient in a sleeping bag and providing contact with a warm body. The patient should **not** be placed a sleeping bag with another individual who is hypothermic. This method should be considered a last resort since it may endanger the rescuer and is less efficient than other methods.
3. Encourage the patient to drink warm fluids as soon as he, or she, is capable of swallowing and protecting his or her airway.

- D. Treatment for Severe Hypothermia with Signs of Life (e.g. Pulse and Respirations Present):
1. Treat the patient as outlined in sections B and C above with the following exceptions:
 - a. Do **not** put severely hypothermic patients in a shower or bath.
 - b. Do **not** give a patient oral fluids or food unless he or she is capable of swallowing and protecting his or her airway.
 - c. Do **not** attempt to increase heat production through exercise.
 2. Treat patients who are hypothermic very gently (do not rub or manipulate extremities).
- E. Treatment for Severe Hypothermia with No Life Signs:
1. Treat as above.
 2. If no pulse (after checking for up to 45 seconds) and no respirations and no contraindications as listed in section K on page 2, start CPR.
 3. Use mouth-to-mask breathing.
 4. Reassess the patient's physical status periodically.
 5. Transfer to a medical facility as soon as possible.

Hypothermia

First Responder/Emergency Medical Technician-I¹

A. Assessment of Patient

1. Severe Hypothermia: If the patient is cold and has any of the following signs or symptoms, he is considered to have severe hypothermia:
 - a. Temperature of 90° F (32.2° C) or less.
 - b. Depressed vital signs, such as a slow pulse and/or slow respiration.
 - c. Altered level of consciousness, including slurred speech, staggering gait, decreased mental skills, or the lack of response to verbal or painful stimuli.
 - d. No shivering in spite of being very cold. (Note: This sign is potentially unreliable and may be altered by alcohol intoxication.)
2. Mild Hypothermia: If the patient is cold and does not have any of these signs or symptoms, he is considered to have mild hypothermia.

B. Basic Treatment for Hypothermia

1. Prevent further heat loss. Insulate from the ground, protect from the wind, eliminate evaporative heat loss by removing wet clothing or by covering the patient with a vapor barrier (such as a plastic garbage bag), cover the head and neck and move the patient to a warm environment. Consider covering patient's mouth and nose with a light fabric to reduce heat loss through respirations.
2. Treat and transport to a medical facility.
3. Do not give alcohol.
4. When administered, oxygen should be heated to 105° - 108° F (40.5° - 42.2° C), measured at the mouth, and humidified, if possible.
5. Splinting should be performed, when indicated, with caution to prevent additional injuries to frostbitten tissues.

¹ **Community Health Aides should use the protocols for their level of EMS certification. CHAs who are not certified as EMTs should use the EMT-I protocols for cold injuries.**

C. Treatment for Mild Hypothermia

1. Treat the patient as outlined in Section B.
2. If there is no way to get to a medical facility, rewarm the patient gradually by:
 - a. Placing patient in as warm an environment as possible.
 - b. Increasing heat production through exercise and calorie/fluid replacement. This method of adding heat is particularly important when emergency care is not readily available as in remote or prolonged transport environment.
 - c. Rewarming passively through the application of insulated heat packs to high heat transfer/loss areas such as the head, neck, underarms, sides of the chest wall, and groin, and heavy insulation to prevent further heat loss.
 - d. Considering warm showers and warm bath if the patient is alert.
 - e. Placing patient in a sleeping bag and providing contact with a warm body. The patient should **not** be placed a sleeping bag with another individual who is hypothermic. This method, however, should be considered a last resort, however, since it may endanger the rescuer and is less efficient than other methods.
3. Encourage the patient to drink warm fluids as soon as he, or she, is capable of swallowing and protecting his or her airway.

D. Treatment for Severe Hypothermia with Signs of Life (e.g. Pulse and Respirations Present):

1. Obtain a core temperature (rectal).
2. Treat the patient as outlined in sections B and C above with the following exceptions:
 - a. Do **not** put severely hypothermic patients in a shower or bath.
 - b. Do **not** give a patient oral fluids or food unless he or she is capable of swallowing and protecting his or her airway.
 - c. Do **not** attempt to increase heat production through exercise.
3. Treat patients who are hypothermic very gently (do not rub or manipulate extremities).
4. Transport patient to a medical facility as soon as possible.
5. Reassess the patient's physical status periodically.

E. Treatment for Severe Hypothermia with No Life Signs:

1. Treat as above.
2. If no pulse (after checking for up to 45 seconds) and no respirations and no contraindications as listed in section K on page 2, start CPR.
3. Use mouth-to-mask breathing.
4. Advanced airway devices: The indications and contraindications for advanced airway devices are the same in both the hypothermic and the warm patient. However, hypothermic patients may be more difficult to intubate, precipitation of ventricular fibrillation may be a danger, and intubation should only be attempted under optimum conditions by skilled personnel only if the airway is inadequate.
5. If the rescuers are authorized to use an automated external defibrillator and the device states that shocks are indicated, one set of three stacked shocks should be delivered. If the core temperature of the patient cannot be determined or is above 86° F, treat the patient as if normothermic. If the patient's core temperature is below 86° F, discontinue use of the AED after the initial three shocks.

6. If resuscitation has been provided in conjunction with rewarming techniques for more than 60 minutes without the return of spontaneous pulse or respiration, contact the base physician for recommendations. If contact with a physician is not possible, Emergency Medical Technicians may consider terminating the resuscitation in accordance with AS 18.08.089 and local protocols.

COLD WATER NEAR DROWNING

General Points

- A. For the purposes of this document, cold water is defined as being less than 70° F (21.1° C).
- B. Anyone submerged long enough to be unconscious should be transported to the hospital, *even if they he or she has regained consciousness*.
- C. If the person has been under water for **LESS** than one hour, full resuscitative efforts should employed. If the person has been under water for **MORE** than one hour, resuscitation efforts are usually unsuccessful.
- D. Recent legislation (AS 18.08.089) has empowered EMTs, paramedics and physicians-assistants to declare death in the field following 30 minutes of properly performed advanced life support, even when the patient is hypothermic. It is recommended in these cases, however, that resuscitations be continued for at least 60 minutes and be combined with the rewarming techniques found in these guidelines before being terminated. Please note that this legislation does not authorize Emergency Trauma Technicians and the general public to pronounce a patient dead.
- F. If it is not known how long the person has been under water, you should consider him/her to have been under water less than one hour.
- G. There is no difference between fresh and salt water near drowning regarding outcome or treatment.
- H. If it does not delay rescue, maintain the patient's body in a horizontal position while removing him/her from the water.
- G. These principles apply to any near drowning, not just those in cold water. The difference between warm and cold water is that in submersions greater than 6 minutes, the chance for survival in warm water is much less than in cold water. The colder the water, the better the chance for survival.
- I. Because hypothermia is rarely profound (below 85° F (29.4° C) in cold water near drowning, the hypothermia aspect of the problem is less critical than the pulmonary or coagulation aspects. Thus, rewarming is done very cautiously and gradually, without the need for invasive techniques such as peritoneal lavage or AV shunts.
- J. Many near drowning patients die of a particular type of disseminated intravascular coagulation, not from their pulmonary problems.
- K. Persons surviving an immersion episode should be transported to the nearest medical facility for further evaluation. Accumulation of fluid in the lungs (noncardiogenic pulmonary edema) may develop 6 - 24 hours after submersion.

COLD WATER NEAR DROWNING

General Public

Evaluation and Treatment

1. The Heimlich Maneuver should be used only when a foreign body airway obstruction is suspected.
2. CPR must be started immediately when the patient is determined to be pulseless after a pulse check of up to 45 seconds.
3. Assess carefully for associated injuries.
4. Follow the General Public section on Hypothermia on page 3 for additional therapy as needed.

COLD WATER NEAR DROWNING:

First Responder/Emergency Medical Technician-I

Evaluation and Treatment

1. The Heimlich Maneuver should be used only when a foreign body airway obstruction is suspected.
2. CPR must be started immediately when the patient is determined to be pulseless after a pulse check of up to 45 seconds.
3. Assess carefully for associated injuries.
4. Follow the Emergency Medical Technician I section on Hypothermia on page 7 for additional therapy as needed.

FROSTBITE

Introduction

Frostbite is the freezing of tissue and may involve only superficial tissues or may extend to the bone. The onset and severity of frostbite may be affected by air temperature, wind speed, duration of exposure, amount of exposed area, and predisposing conditions such as:

- poor or inadequate insulation from the cold or wind;
- impaired circulation from tight clothing or shoes;
- fatigue;
- altitude;
- immersion;
- injuries;
- circulatory disease;
- poor nutrition;
- dehydration;
- hypothermia;
- alcohol or drug use; and
- tobacco products.

A discussion of the pathophysiology of frostbite is beyond the scope of this document. Simply put, damage to the frostbitten tissues is caused by crystallization of water within the tissues, typically between the cells, as well as changes in electrolyte concentration within the cells.

Frostbite is frequently seen in Alaska, although, in most circumstances, the frostbite is superficial and treated by the patient at home. Occasionally, it is severe enough to warrant transport to a medical facility for evaluation and treatment. Seldom will it be necessary for emergency medical personnel to perform in-field rewarming for deep frostbite. It may, however, be necessary to treat patients with superficial frostbite who have sustained other injuries, (e.g. a motor vehicle crash patient who has been exposed to sub-zero temperatures while awaiting the arrival of rescue and medical personnel).

These guidelines are designed to assist prehospital emergency medical personnel in assessing and treating frostbite. In-hospital treatment is beyond the scope of this section and readers are encouraged to refer to "Cold Injury: A Collection of Papers by William J. Mills, M.D. and Colleagues," which appeared in the January/February/March 1993 issue of *Alaska Medicine*, the official journal of the Alaska State Medical Association and the American Society for Circumpolar Health.

FROSTBITE

General Points

- A. Hypothermia and other life threatening conditions may be present in the patient with frostbite and must be evaluated and treated immediately.
- B. When caring for a patient in extremely cold temperatures, take great care to prevent hypothermia, tissues from becoming frostbitten, and already frostbitten tissues from becoming worse.
- C. If transporting a patient with frostbite which will not be rewarmed in the field, the medical provider should protect the frostbitten parts from additional injury and temperature changes.
- D. **Superficial frostbite** affects the dermis and shallow subcutaneous layers of the skin and is recognized by white or gray colored patches. The affected skin feels firm, but not hard. The skin initially turns red and, once frostbitten, is not painful. No tissue loss will occur when treated properly.
- E. **Deep frostbite** affects the dermal and subdermal layers and may involve an entire digit or body part. The skin feels hard and cold and the affected tissue is white or gray. A pulse cannot be felt in the deeply frostbitten tissue and skin will not rebound when pressed.
- F. Large blisters on the frostbitten area indicate that deep frostbite has partially thawed.
- G. Treatment of deep frostbite is usually extremely painful and best accomplished in a medical facility. If you can get the patient to a medical facility within a reasonable amount of time, or do not have the capability to rewarm the tissues properly or cannot prevent refreezing, you should transport the patient rather than attempt to rewarm the tissue in the field. Advice should be sought from a physician by radio or telephone before electing to rewarm frostbitten tissue in the field, whenever possible. **In most circumstances, the risks posed by improper rewarming or refreezing outweigh the risks of delaying treatment for deep frostbite.**
- H. Tissue which is thawed and then refrozen almost always dies. Consequently, the decision to thaw the frostbitten tissue in the field commits the provider to a course of action which may involve pain control, maintaining warm water baths at a constant temperature, and protecting the tissue from further injury during rewarming and eventual transport. If rewarmed in the field, frostbitten extremities cannot be used for ambulation.
- I. It is reasonable to consider rewarming the frostbitten tissue in a controlled manner if uncontrolled, spontaneous, rewarming is likely to occur during prolonged evacuation or transport.
- J. Make plans for transporting the patient as early as circumstances allow. In some circumstances, when frostbite is not severe and is not complicated by other injuries, and there are resources available to monitor the patient's progress, a physician should be consulted. He or she may decide the patient should not be transported. This should be clearly understood and carefully documented by the prehospital provider.

K. **Do not:**

1. rub the frozen part;
2. allow the patient to have alcohol or tobacco;
3. apply ice or snow;
4. attempt to thaw the frostbitten part in cold water;
5. attempt to thaw the frostbitten part with high temperatures such as those generated by stoves, exhaust, etc.; and
6. break blisters which may form.

L. Frostbitten tissues should be handled extremely gently before, during, and after rewarming.

FROSTBITE:

Evaluation and Treatment

- A. Anticipate, assess and treat the patient for hypothermia, if present.
- B. Assess the frostbitten area carefully since the loss of sensation may cause the patient to be unaware of soft tissue injuries in that area.
- C. Obtain a complete set of vital signs and the patient's temperature.
- D. Obtain a patient history, including the date of the patient's last tetanus immunization.
- E. If there is frostbite distal to a fracture, attempt to splint the fracture in a manner which does not compromise distal circulation.
- F. Determine whether rewarming the frostbitten tissue can be accomplished in a medical facility. If it can, transport the patient while protecting the tissue from further injury from cold or impacts.
- G. If the decision is made to rewarm frostbitten tissue in the field, you should prepare a warm water bath (approximately 100° - 106° F) in a container large enough to accommodate the frostbitten tissues without them touching the sides or bottom of the container.

Advanced life support personnel should administer morphine or other analgesics in accordance with physician signed standing orders or on-line medical control if the frostbitten area is extensive and the medical providers are authorized to do so.
- H. A source of additional warm water must be available.
- I. Shock due to frostbite is very uncommon. However, medical personnel should always be alert for shock and begin treatment at the earliest sign it is developing. If the frostbite patient develops shock, personnel should perform a thorough examination for additional injuries.
- J. Remove jewelry and clothing, if present, from the affected area.
- K. If possible, consult a physician regarding the administration of oral analgesics, such as acetaminophen, ibuprofen or aspirin.
- L. Water should be maintained at approximately 100° - 106° F and gently circulated around the frostbitten tissue until the distal tip of the frostbitten part becomes flushed.
- M. Pain after rewarming usually indicates that tissue has been successfully rewarmed.
- N. After re-warming, let the frostbitten tissues dry in the warm air. Do **not** towel dry.
- O. After thawing, tissues that were deeply frostbitten may develop blisters or appear cyanotic. Blisters should not be broken and must be protected from injury.
- P. Pad between affected digits and bandage affected tissues loosely with a soft, sterile dressing.
- Q. Rewarmed extremities should be kept at a level above the heart, if possible.
- R. Protect the rewarmed area from refreezing and other trauma during transport. A frame around the frostbitten area should be constructed to prevent blankets from pressing directly on the injured area.
- S. Do not allow an individual who has frostbitten feet to walk except when the life of the patient or rescuer is in danger. Once frostbitten feet are rewarmed, the patient becomes nonambulatory.

FROSTBITE

References

Community Health Aid Manual, Robert Burgess, M.D., U.S. Government Printing Office, SN 017-026-00106-9, pages 336-338.

Emergency Care, Seventh Edition, Harvey Grant, et al, Brady Publishing, 1995.

Paramedic Emergency Care, Second Edition, Bledsoe, Porter, and Shade, Brady Publishing, 1995, pages 876-877.

Emergency Care of the Sick and Injured, Sixth Edition, Crosby and Lewallen, American Academy of Orthopedic Surgeons, 1995, pages 410-412.

Hypothermia, Death by Exposure, Wm. W. Forgey, M.D., ICS Books, 1985, pages 105-110.

Wilderness EMT Curriculum, Goth, Peter, Wilderness Medical Associates, 1990, pages 16:1 - 16:3.

"Cold Injury: A Collection of Papers by William J. Mills, M.D. and Colleagues," Alaska Medicine, Volume 35, Number 1.

24 HOUR EMERGENCY DEPARTMENTS

(All in area code 907)

For more information, contact your nearest referring medical facility or one of the following:

INTERIOR REGION

Fairbanks Memorial Hospital, Fairbanks - 452-8181

SOUTHERN REGION

Alaska Native Medical Center, Anchorage - 729-1729
Central Peninsula General Hospital, Soldotna – 262-4404
Alaska Regional Hospital - Alaska, Anchorage, - 276-1131
Providence Hospital, Anchorage - 562-2211
Valley Hospital, Palmer – 746-8600

SOUTHEAST REGION

Bartlett Regional Hospital, Juneau - 586-2611
Ketchikan General Hospital – 225-5171

TEMPERATURE CONVERSIONS

$$Centigrade = (\frac{(Fahrenheit - 32) * 5}{9})$$

$$Fahrenheit = ((\frac{9 * Centigrade}{5}) + 32)$$

Centigrade	Fahrenheit
44.0	111.2
43.0	109.4
42.0	107.6
41.0	105.8
40.0	104.0
39.0	102.2
38.0	100.4
37.0	98.6
36.0	96.8
35.0	95.0
34.0	93.2
33.0	91.4
32.0	89.6
31.0	87.8
30.0	86.0
29.0	84.2
28.0	82.4
27.0	80.6
26.0	78.8
25.0	77.0
24.0	75.2
23.0	73.4
22.0	71.6
21.0	69.8
20.0	68.0
19.0	66.2
18.0	64.4
17.0	62.6
16.0	60.8
15.0	59.0
14.0	57.2
13.0	55.4
12.0	53.6
11.0	51.8
10.0	50.0

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Reprinting

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REVISION HISTORY

Date	Changes
1882	Initial version developed and distributed.
1988	Major revision based on meeting of subject experts.
01/1996	Major revision, including addition of frostbite section.
02/1996	Release corrected several typographic errors and clarified exceptions to treatment for severe hypothermia.
10/01/1999	Updated telephone numbers and statutory references. Deleted index.